

Paso Robles Police Department Outdoor Training Facility Improvements – Phases 2 & 3

Gavin Abraham

California State Polytechnic University San Luis Obispo, Ca

This paper outlines the pre-construction and construction of the 24,300 square foot Paso Robles Police Department outdoor training facility improvements. The project focuses on 12,000 square feet of the total site with improvements that include earthwork and new concrete flatwork. This project is a group project with Zach Stellini and Nic Petri that is broken up into three phases. This report will primarily focus on phases 2 & 3, which include concrete flatwork and finish grading. The purpose of this project was to provide the Paso Robles Police Department with a modern, functional facility that allows its officers to be better equipped to protect the community of Paso Robles.

Key Words: Grading, Excavation, Concrete, Asphalt, Police

Introduction

The project is located near the Paso Robles Municipal Airport at the Paso Robles Police Departments (PRPD) private training facility. These grounds have been used mainly for firearms tactics training for the PRPD and California Highway Patrol (CHP). Once this project was brought to the attention of students Gavin Abraham, Nic Petri, and Zach Stellini they met with a group of IME students who developed a rough design for an indoor training facility in price range of \$3.5-\$5 million. The IME students intended to hand off the project to a group of Construction Management students to complete the preconstruction and bid phase of the project. We then met with PRPD Commander Caleb Davis to gather a better understanding of the police department's goals and objectives. At this point, the conclusion was made that a project of that magnitude was not going to be built anytime soon for financial reasons, and it was decided that we would remodel the existing training facility instead. Once we understood their goals for the project, we agreed to create a more functional training facility that would better allow the police department to serve the community. With the goals and purpose for their improvements in mind, Zach, Nic and I began our initial site survey and design. The biggest concern for both parties was the uneven existing grade, and undefined target distances as well as drainage and erosion issues. In order to solve these problems, our group created a new design of concrete flatwork that would create a level ground for their training as well as infilling with decomposed granite (DG) and turf. Once this design was approved by Commander Davis and Rangemaster Sergeant Hermanson, we had to decide how to break the project into phases and who would oversee each phase for a successful project. Our design came to 3,320 sf of concrete flatwork with 3 vertical pathways and five horizontal pathways. Once PRPD approved the design and we designated responsibilities amongst the project team we were able to get our official approval from Phil Barlow and Dan Knight as our Subject Matter Expert. This project was funded by the PRPD and City of Paso Robles using money from tax measure J20. In addition, we were able to secure equipment and tools that were graciously donated from Mike Bridgman and Dan Knight, as well as material/equipment discounts from Alliance Concrete, CalPortland, Paso Robles Public Works, and Quinn Caterpillar. This paper will outline the preconstruction, construction, conclusion, and lessons learned for concrete and finish grading which are phases 2 & 3 of this project.

Preconstruction

After the project was approved, we began the preconstruction phase. Fortunately, the project was funded by J20 Tax Revenue, so fundraising was not necessary. From the very beginning we anticipated a large volume of work given the previous designs from the IME students. However, once we talked with the PRPD and came to an understanding, we agreed that a remodel of the existing range was more feasible than preconstruction work for a \$5 million dollar project that had yet to be approved by the city. After going through multiple design reviews with Commander Davis and Sergeant Hermanson, we agreed that a grid system of concrete walkways backfilled with DG and artificial turf would be the best way to suit their needs. Once our final design was confirmed, we began to procure quotes for materials and equipment rentals to create a budget for review by the owners' representatives. For material quotes, we reached out to 2-3 local suppliers for each item to ensure we were getting the best possible price. With the estimate completed, we proceeded to have one final meeting with the Paso Robles City Public Works Superintendent Freda Berman and the PRPD to ensure that our design met city standards, was within budget, and to address liability concerns. Once the design and budget were approved, we were ready to begin the construction phase of the project. Phase 1 of the project included earthwork and placement of Class II subgrade. Phases 2 & 3 pertained to concrete placement and finishing, as well as backfill, finish grading, and miscellaneous sitework. The concrete phase began on February 12th and concluded on April 22nd. Finish grading and miscellaneous sitework occurred from April 22nd-23rd.

Construction

Layout

Most of the layout for the site was completed in phase 1 of the project. The site had no existing surveyed benchmarks, so we decided to utilize an existing concrete pad located underneath the targets as a benchmark and slope the concrete and finish grade at 1% up range. Our class II subgrade was placed at the 1% slope, in strips 4.5' wide to accommodate forms. Once the subgrade was complete, we began to lay out dimensions and elevations for the walkways. The range is roughly 50 yards long by 80 feet wide, for a total area of 12,000 square feet. Our flatwork design consisted of three 150' walkways spanning the length of the range, as well as five lateral walkways intersecting perpendicularly to the walkways running the length of the range. These lateral walkways were to be placed at 5, 10, 15, 25, and 50 yards respectively. There was also a concrete curb that was to be located at the 3-yard distance. Using a 200-foot measuring tape, we confirmed that the layout of the subgrade was correct. We then utilized a Topcon sloping laser set at 1% to construct batter boards located outside of the subgrade. Using these batterboards, we installed stringlines set at the proper elevation and dimensions to span the length of the concrete walkways. We had three separate pours, so this process was repeated 3 times. The initial design called for Artificial turf to be used as finish grade material in the front half of the range, with DG to be used in the back half. However due to budget concerns, the PRPD decided upon substituting all artificial turf with DG. Our DG finish grade material was to be backfilled in between the walkways, so layout was not necessary besides checking initial and finish grade with the laser.

Concrete

After Layout was complete, we proceeded to construct forms. We utilized wooden stakes with 2x4 and deck screws, as well as 2x8 and 3' metal stakes for our first pour, which included the 5-yard line,

perpendicular walkways up to 5 yards, as well as the curb located at three yards. We utilized welded wire mesh in place of rebar for reinforcement. Reinforcement was not required, but was requested by the PRPD owners reps. In addition, one day before the pour we received a change order to install electrical conduit and junction boxes in the concrete. We installed the boxes in the middle of the walkway, at the intersection between the lateral and perpendicular walkways at 5, 15, 25, and 50 yards. There was also a continuous conduit line that spanned the entire 50 yards of the range in the middle of the middle perpendicular walkway that spanned the entire 50 yards of the range. For our first pour, we finished the concrete with a crew of 6 individuals and Dan Knight's infinite concrete wisdom as our guide. We utilized Alliance Ready Mix, with 10 yards of city-spec sidewalk mix and the tailgate method. The following two pours were formed with metal stakes, as we found they were both faster and easier to pound into the compacted class II subbase. Forms were stripped prior to starting the next pour, as we re-used formwork to save the client money. Our second pour encompassed the 10-yard, 15 yard, and all three lateral walkways. We accomplished this pour with seven CM students, and 12 off-duty PRPD officers. We purchased additional lumber, as this was our biggest pour and the existing formwork we had was not sufficient to cover the required area. An additional change order occurred at the time of forming the third pour, which directed us to reinforce the lateral walkways at 25 and 50 yards with #4 rebar placed at 1' O.C both parallel and perpendicular to the formwork to add extra reinforcement to allow standard patrol cars, as well as special operations bearcats to drive over the concrete for training purposes. Our third and final pour involved a slightly altered mix design, coming from CalPortland in paso robles. This pour was easy to place, as we utilized a pump due to minimal room on site. However we were shorthanded, and ended up finishing 22 yards with 5 individuals, 2 CM students and 3 PRPD officers. In the third pour, we embedded a custom-fabricated 2'x 2' PRPD badge at the 50 yard-line. All walkways were edged with a rough broom finish, and control joints were placed at 8'-10" O.C for lateral walkways and 4' O.C for perpendicular walkways. All formwork was repurposed into a total of 47 target stands for the range.

Earthwork

This Project was broken into three phases, with the majority of the earthwork being in phase 1, completed by Zach Stellini. However, as I was there for the duration of all three phases, I was able to assist Zach with his deliverables in phase 1. The earthwork in phase three relates to finish grading, installing DG, and some miscellaneous site civil improvements. We were not able to grade the entire site initially, as the project was located directly next to a creek, and in order to qualify for California Environmental Quality Act (CEQA) exemption we opted not to do any large-scale grading. Instead, finish grading for dirt occurred directly after the forms were stripped for pour number 2. We utilized a Caterpillar 229D skidsteer and Dynapac roller generously donated by Mike Bridgman to accomplish this task. In addition, we used the sloping laser to maintain our finish slope of 1% towards the end of the range. Finish grading was completed in one day, and the following day we began to place DG material. The material was stored on the side of the range, which required us to shuttle it back and forth over our newly poured walkway to move it. Every section of walkway that was required to be driven over was protected with plywood and had dirt ramps temporarily built on either side to protect the edges. We started at the front of the range between 3 and 5 yards and worked our way up to 15 yards with the material. This process occurred over the course of three days. We utilized the laser for finish grade, and compacted in two 2" lifts with the roller. In the first three sections between 3-5, 5-10, and 10-15 yards we utilized a 2x4 as a screed to ensure proper finish grade. The rest of the DG was installed following the stripping of formwork for the third and final pour and lasted approximately three days. This material was compacted with the roller in two 2" lifts. The area was too big to screed, so we calculated finish grade with the sloping laser. We utilized extra DG material to construct a 1:4 slope against the concrete on the west side of the range to provide a visual transition

from the range to the existing environment. All existing grade on three sides of the range had been disturbed during the course of construction, so we rough graded the surrounding area and rolled it to eliminate any imperfections or footprints. Finally, using asphalt grindings both provided and transported for free from the city of Paso Robles, we constructed a parking area directly behind the 50-yard line to provide an elevated surface at less risk of flooding. This area was sloped to allow easy access by vehicle onto the range, as well as for drainage purposes. We compacted the material with the roller in three 6" lifts for a total of eighteen inches, as the elevation for top of concrete at 50 yards was roughly at nineteen inches.

Cost

The original Estimated cost of the project was \$18,000, with \$2,000-\$4,000 allotted for contingencies. Despite two significant change orders we accomplished the overall project for \$16,577.74. Phase one was completed for \$3,925, phase two for \$10,990.92 and phase three for \$1,661.82. The reason for us being under budget is primarily due to substantial discounts on materials provided by CalPortland, Alliance Ready Mix, Paul's Concrete Pumping and Hank Savage Concrete. In addition, the generous donation of equipment from Mike Bridgman saved us thousands of dollars

Schedule

Phase one was completed on 2/21/2021, almost a month behind our expected date of 1/22/2021 due to delays from weather and pending city approval. However, we were able to finish a month ahead of our phase one hard deadline of 3/22/21. Phase two began on 2/23/2021 and ended on 4/18/2021. Phase three began on 3/22/2021, and ran concurrently with phase two until 4/27/2021, when we officially handed off the project. We were well ahead of schedule of our hard deadline of 6/1/2021.

Lessons Learned

In both phases two and three, there were ample learning opportunities. We initially bid and started work on the job with the intent of using wood stakes for formwork. However after experiencing substantial difficulties after pour one due to our subbase exceeding the 95% required relative compaction, we learned that round metal stakes, preferably 18", were much faster and easier to install. Another big takeaway was fluctuations in finish subgrade elevation affecting our concrete pour volume. We are students, and although our forms were set at the perfect elevation, our subgrade was not because we did not have enough skill and experience to do so. Therefore, in pour one, we had to install some cold joints due to the fact that we did not order enough concrete because our subgrade was actually up to 2" low in certain places. We overcompensated on the second pour, and ended up with two extra yards that went to waste due to our subgrade being too high. We finally learned this lesson on the third pour, when we were only 2 yards short and ended up ordering a cleanup truck as cold joints were not an option at that stage in the project. We also utilized tailgating for our first two pours, which we found produced a high degree of waste and made the finishing process exponentially more difficult. This was due to the fact that we would overload the forms with concrete in some areas and have to move it by wheelbarrow to other locations. Pumping proved to be much more efficient and made the whole process easier. The quality of aggregate makes a very large difference in the outcome of the finished sidewalk. During one pour we received a truck that had river rock as aggregate, as opposed to the ¾" crushed rock aggregate as specified by city standards. This aggregate has round edges, so it is not able to mesh together like ¾" crushed rock, which has jagged and sharp edges. This results in the concrete being much harder to work with, and very difficult to screed. It also

hinders the process of pushing the rock down to bring up the cream, which ultimately determines the quality of the finish.



Figure A: Existing Conditions

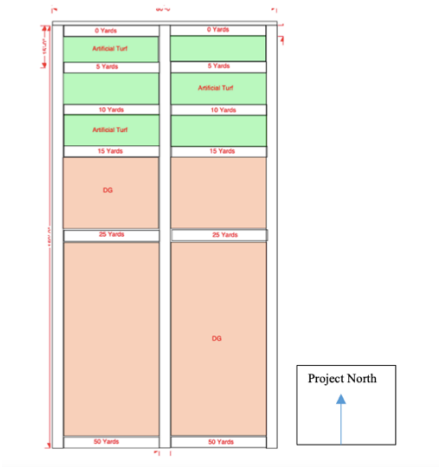


Figure B: Civil Plan



Figure C: Phase one (Earthwork) underway



Figure D: Phase Two (Concrete) Formwork for Pour One



Figure E: Pour One Complete



Figure F: Pour Two Complete



Figure G: Pour Three Complete, and beginning of Phase Three (DG)



Figure H: Phase Three underway



Figure I: 100% Completion